DIVERSE views have been expressed regarding the occurrence of Lower Tertiary sediments in Arunachal Pradesh. Based on seismic studies Bhandari et al. (1974) indicated the presence of Lower Tertiary sediments in Arunachal Pradesh. Acharyya et al. (1975) and Ray and Acharyya (1976) inferred the possibility of presence of Palaeogene sediments along the frontal zone in the eastern Himalaya. Jain and Dutta (1978) described dinoflagellate and spore/pollen assemblage from a limestone boulder at the contact of Gondwana and Upper Tertiary exposures in the sub-Himalayan region near Likabali, Siang District. These authors could not determine whether these sediments are in situ or the drifted ones, but highlighted the significance of marine Lower Tertiary palynofossil recovery and suggested the possibility of an eastern extension of the Eocene sea. Tripathi et al. (1979), however, for the first time identified 1,150 m thick Eocene sequence at the right bank of Siang River near Rengging in Siang District. Floral and faunal evidences provided additional support for the presence of Lower Tertiary sediments in Arunachal foot-hills and Lesser Himalaya (Tripathi et al., 1981a, b; Singh & Singh, 1983; Prasad & Dey, 1986; Singh & De, 1987).

Tripathi et al. (1981a) reported a rich microfaunal assemblage from Rengging along the Siang River and assigned Upper Palaeocene to Lower Eocene age to these sediments. Tripathi et al. (1981b) further discovered a rich floral assemblage of Lower Eocene near Geku in Siang District comprising dicot leaves. Later, Singh and Singh (1983) discovered another Eocene outcrop about 19 km south-east of Yinkiyong near Dalbing Village in Yamne Valley and recovered a rich microfaunal assemblage comprising mainly of foraminifera and a few gastropods and bivalve shells of late Early Eocene age. Subsequently, Tripathi and Singh (1983) recorded the occurrence of Nummulites-bearing
limestone bands at Dalbing and also near the Gobuik Village.

Prasad and Dey (1986) recorded Eocene palynotaxa from Lesser Himalayan sediments exposed near Dalbing and Yinkiyong, in Siang District. Singh and De (1987), while giving an account of the Lower Tertiary rocks of Siang District, discussed about the occurrence of Eocene sediments near Rengging, Dalbing, Gobuik and Guru villages.

The present palynological studies were undertaken to corroborate the information about the occurrence of Lower Tertiary sediments in Arunachal Pradesh.

**GEOLOGY OF THE AREA**

The generalised tectono-stratigraphic succession in Siang District consists of the following stratigraphic belts from south to north: Siwalik Group, Gondwana Group, Abor Volcanics, Miri Group, and Bomdila Group. Besides, Lower Tertiary sediments also occur in this area, which occupy a peculiar position at two different localities. The first one lies in the frontal parts of the Lesser Himalaya along the Main Boundary Fault in a tectonic belt near Rengging, and the other one lies much north in the Lesser Himalaya in a tectonic window near Dalbing.

The Lower Tertiary sediments occurring along the Main Boundary Fault are exposed at the right bank of the Siang River in a small outcrop nearly 2.4 km south-east of Rengging. This outcrop can be approached through a motorable-track which starts on the right side near 10 km stone point on Pasighat-Pangin road. Larger foraminiferids and palynomorphs of Early Eocene age, along with some Permian forms have been recovered from it. Lithologically also, it shows wide variety of sediments ranging from sandstone, shale, arenaceous limestone, calcareous sandstone to basic rocks. It is, thus, evident that this outcrop relates to a tectonic-melange zone.

The other occurrence of Lower Tertiary sediments in a tectonic window, on the other hand, shows undisturbed sequence. This is exposed much north from Main Boundary Fault in Lesser Himalaya, near Dalbing Village in Yamne Valley. The fossiliferous exposure near Dalbing is located on a hillock on the other side of the Yamne River. To reach Dalbing one has to get down from Yinkiyong-Maryang road (near 39 km stone) to Yamne River, and climb up the hillock following a foot track.

The lithology of Lower Tertiary sediments in this section consists of light greenish-grey calcareous slates interbedded with dark grey argillaceous limestone (sometimes arenaceous) containing calcite veins, bluish-grey to greyish slaty shales and sandstones. The shales are sometimes sandy and at places calcareous. These rocks are metamorphosed to a low grade and as a result the slates have become phyllitic shales. The fossiliferous slates and limestone have yielded a rich assemblage of larger foraminiferids, a few gastropods and bivalve shells, and a rich palynological assemblage too.

**MATERIAL AND METHOD**

Samples for the present palynological work were collected from the three sections, viz., (i) Siang River Section near Rengging, (ii) Yinkiyong-Gobuik Road Section, and (iii) Dalbing Section (Text-fig. 1).

Lithology of the collected samples is as below:

<table>
<thead>
<tr>
<th>SECTION</th>
<th>SAMPLE NO.</th>
<th>LITHOLOGY</th>
<th>PRODUCIVE (+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siang River</td>
<td>T13A/25</td>
<td>Calcareous Sandstone</td>
<td>+</td>
</tr>
<tr>
<td>Section near</td>
<td>T13A/26</td>
<td>Grey Shale</td>
<td>+</td>
</tr>
<tr>
<td>Pasighat</td>
<td>T13A/27</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>T13A/28</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>T13A/29</td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>
Fresh samples were collected from these sections for the recovery of palynofossils. Nearly 100 gm of each sample was manually crushed followed by treatment with HF, HCl and HNO₃ depending upon the lithology of individual sample. Residues of macerated samples were treated with 5-10 % KOH and the concentrated material of the productive samples were mixed with polyvenyle alcohol and then mounted in Canada Balsam. The samples and prepared slides have been deposited in the Museum of Birbal Sahni Institute of Palaeobotany, Lucknow.

SYSTEMATIC PALYNOLOGY

**Genus—*Tricolporopollis* Dutta & Sah 1970**

*Tricolporopollis matanamadhensis* (Venkatachala & Kar) Tripathi & Singh 1985

*Occurrence—*Dalbing Section, Siang District, Arunachal Pradesh.

*Previous record*—Lower Eocene of Kutch (Venkatachala & Kar, 1969).

**Genus—*Laliapollis* Venkatachala & Kar 1969**

*Laliapollis ovatus* Venkatachala & Kar 1969

*Occurrence—*Dalbing Section, Siang District, Arunachal Pradesh.

**Genus—*Pellicieropollis* Sah & Kar 1970**

*Pellicieropollis langenheimii* Sah & Kar 1970

*Occurrence—*Siang River Section near Rengging, Siang District, Arunachal Pradesh.

*Previous record*—Lower Eocene of Kutch (Sah & Kar, 1970).

*Pellicieropollis* sp.

*Description*—Pollen almost circular in shape, 54 μm in polar view, tricolporate. Ectoaperture short, 10-12 μm long, ends pointed, 5-7 μm wide at equator. Endoaperture elliptic, equatorially elongated, almost as wide as ectoaperture. Exine tectate, 2 μm thick, baculate. Bacula heads very small and form negative reticulum in surface view.

*Remarks*—*Pellicieropollis* sp. differs from *P. langenheimii* Sah & Kar 1970 in shape and in lacking a thickening around the pore.

*Occurrence—*Siang River Section near Rengging, Siang District, Arunachal Pradesh.

**Genus—*Ctenolophonidites* van Hoeken-Klinkenberg emend. Salard-Cheboldaeff 1977**

*Ctenolophonidites costatus* (van Hoeken-Klinkenberg) van Hoeken-Klinkenberg 1966

*Occurrence—*Dalbing Section, Siang District, Arunachal Pradesh.

**Genus—*Ligulifloraeidites* Kar 1985**

*Ligulifloraeidites pilatus* Kar 1985

*Occurrence—*Dalbing Section, Siang District, Arunachal Pradesh.

*Previous record*—Early Eocene of Panandhro lignite, Kutch (Kar, 1985).
Genus — *Incrotontpollis* Jansonius & Hills 1981

*Incrotontpollis* sp.

**Pl. 1, figs 9-11**

Description — Pollen semicircular in shape, nonaperturate, 35 μm in size. Pollen densely covered with 6.8 μm long and 3.4 μm wide projections having truncated tips. Exine 9 μm thick.


Occurrence — Yinkiyong-Gobuik Road Section, Siang District, Arunachal Pradesh.

**STRATIGRAPHIC SIGNIFICANCE**

Out of 49 rock samples collected from the above mentioned three sections only 17 proved productive. The palynoassemblage is constituted by 11 genera and 16 species and is represented by pteridophytic spores and angiospermic pollen grains. In the present paper only selected angiospermic palynotaixa have been described. These are: *Lakiapollis ovatus*, *Tricolporopolis matanamadhensis*, *Pellicieroipollis langenheimii*, *Ctenolophonidites costatus* and *Incrotontpollis* sp.

These palynotaixa have earlier been recorded from the Lower Eocene sediments of Kutch, Meghalaya, Bengal and south India basins (Venkatachala & Kar, 1969; Dutta & Sah, 1970; Sah & Kar, 1970; Kar, 1978; Kar & Saxena, 1981; Tripathi & Singh, 1985; Baksi et al., 1979; Saxena et al., in Press). Stratigraphic significance of these taxa in India and tropical Africa has been established by the palynological work carried out in these parts by above mentioned workers and Germeraad et al. (1968), Thanikaimoni et al. (1984) and Venkatachala et al. (1989). However, stratigraphic ranges of some of the presently recovered palynotaixa in Lower Tertiary sediments of Siang District deserve special attention.

*Ctenolophonidites costatus* ranges from Middle Eocene to Upper Eocene (Venkatachala et al., 1989; Saxena & Khare, in Press), *Lakiapollis ovatus* and *Tricolporopolis matanamadhensis* from Palaeocene to Upper Eocene (Venkatachala & Kar, 1969; Tripathi & Singh, 1985) whereas, *Pellicieroipollis langenheimii* is restricted to the Lower Eocene (Sah & Kar, 1970; Venkatachala et al., 1989). Thus the present assemblage confirms the occurrence of Early Tertiary sediments in Arunachal Himalaya.

**ACKNOWLEDGEMENTS**

This paper forms a part of the Collaborative Research Project with Wadia Institute of Himalayan Geology, Dehradun. The authors are thankful to the Directors of both the institutes for providing facilities to carry out this study. The authors are grateful to Dr. H. P. Singh for his keen interest and guidance.

**REFERENCES**


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**PLATE 1**

(All photographs enlarged Ca × 1000)

1.2. *Lakiapollis ovatus* Venkatachala & Kar; Slide no. BSIP 10438; Coordinates: 98.3 × 10.6

3. *Pellicieroipollis* sp.; Slide no. BSIP 10440; Coordinates: 112.3 × 12.5

4. *Tricolporopolis matanamadhensis* (Venkatachala & Kar) Tripathi & Singh; Slide no. BSIP 10438; Coordinates: 99.7 × 11.4

5.8. *Liguifloraeidites pilatus* Kar; Slide no. BSIP 10439; Coordinates: 113.4 × 10.6

6.7. *Pellicieroipollis langenheimii* Sah & Kar; Slide no. BSIP 10441; Coordinates: 102.5 × 10.3

9.11. *Incrotontpollis* sp.; Slide no. BSIP 10433; Coordinates: 103.5 × 11.2

12. *Ctenolophonidites costatus* (van Hoeken-Klinkenberg) van Hoeken-Klinkenberg; Slide no. BSIP 10435; Coordinates: 102.6 × 8.7


